REMARKS:

The Official Action of July 2, 2007 has been reviewed and this application has been amended as believed appropriate. The examiner's withdrawal of the previously stated rejections of claims in this application is noted with appreciation.

Claims 21 - 32 and 43

Claims 21 to 32 and 43 have now been rejected as anticipated by the U.S. patent of Wadlington No. 4,866,587. that rejection is respectfully traversed.

The Wadlington patent discloses a ringing signal generator with a switching power amplifier having a transformer 110, a switch 120 on the primary and a switch 130 on the secondary side of the transformer. The power amplifier further includes two controllers 140, 150 for controlling the switching of the switches 120, 130 respectively. Furthermore, Wadlington shows two current sensing resistors 114, 119, each connected in series with one of the switches 120, 130, which serve to sense the current flow in the switches 120, 130 (col. 3, lines 57 - 61). For example, the controller 140 biases the current sensing resistor non-conducting when the voltage across the resistor exceeds a certain threshold, where the threshold is established in response to any error signal that is derived from the voltage of the output capacitor 117 and the reference voltage of amplifier 190 (col. 3, lines 61 - 68). In this way the switch 120 is switched ON and OFF.

Contrary to claims 21 to 32 and 43, which claim a DC-DC converter with a power transformer, Wadlington discloses a DC-AC ringing signal generator. Wadlington thus does not anticipate claims 21 to 32 and 43. At paragraph 2, at page 2 of the outstanding Official Action the rejection of claims 21 - 32 and 43 states "Wadlington discloses claimed subject matters a DC-DC converter (figure 1)." This is incorrect. Wadlington at column 4, lines 43 - 51 makes it clear that his Fig. 1 electronic ringing signal generator provides an AC output. Wadlington states:

> By using the AC signal provided by the ringing oscillator 160 in combination with the DC voltage reference source 170 as a reference applied to the error amplifiers 141 and 151 a similar superimposed AC and DC signal appears across the output capacitor 117. This signal is applied to the ringing load 107 through the DC blocking

capacitor 125 which blocks the DC bias voltage on the capacitor 117 and provides a pure AC ringing voltage signal to the load 107.

In addition claim 21 has been amended to require a control circuit that is responsive to a reverse current in at least one of the controlled switches to turn ON that switch. Method claim 43 has been similarly amended. since there is no such teaching in Wadlington (or any other art of record) claims 21 and 43 as well as the dependent claims 22 - 32 should be found patentable over the art of record.

Claims 1 - 20 and 33 - 42

Claims 1 - 20 and 33 - 42 stand rejected under 35 U.S.C. 103 (a) as being unpatentable over Wadlington in combination with the U.S. Kondo patent No. 6,151,233 and the U.S. Taurand patent No, 5,745,351. Again because the Wadlington patent does not related to a DC-DC converter, as do claims 1 - 20 and 33, or to a method of DC-DC conversion, as do claims 34 - 42, modification of the Wadlington circuit as suggested by the examiner would not result in the subject matter of these claims. Moreover there is no suggestion in any of the relied-upon art to make the modification of Wadlington to sense the reverse current as called for in the rejected claims.

Again, Wadlington is contrary to the rejected claims which claim a DC-DC converter with a power transformer while Wadlington discloses a DC/AC ringing signal generator. And Wadlington fails to disclose that the control circuit is responsive to a reverse current through the switch to turn ON the switch at substantially zero voltage across it as claimed for example in independent claims 1, 11, 13, 28, 33, 34 and 36 and that the claimed sensing element for detecting an operating parameter is a control winding on the power transformer as claimed in dependent claim 22.

The Kondo patent describes a synchronous rectifier circuit with a high efficiency even in low load conditions (col. 1, lines 5 - 12). Under light load the switch 11 is typically cut off and switch 15 is closed. The current detector 22 senses the current I_L and sends a signal to the control circuit 21 to cut off switch 15 if the current I_L starts being reversed. Then the current I_L may not become negative and the efficiency can be kept high.

Contrary to the invention as claimed in claims 1 - 20 and 33 - 42, Kondo teaches to sense the current through the inductor 12 but does not disclose current sensing means to sense the current through the switch 11. This document is therefore not relevant regarding the invention claimed. It could not be combined with Wadlington to arrive at the claimed invention.

The Taurand patent relates to a DC-DC converter with control circuits for switches in the primary and the secondary circuits. In col. 6, lines 27 - 31, Taurand describes how the switching on and off in the secondary is controlled:

> Advantageously, the duration of the secondary period is calculated from a set of parameters including at least a parameter corresponding to the supply voltage, a parameter corresponding to the output voltage of the converter, and a value of a maximum current at the output of the converter.

In col. 6, lines 38 - 42, Taurand describes how the switching on and off in the primary is controlled:

> Advantageously, the duration of the primary period is determined by the switching off of the first switch, which is triggered when a current in the primary circuit is higher than a control signal depending upon the difference between the output voltage of the converter and a reference voltage.

At no time does Taurand describe detecting reverse current flow in a semiconductor switch to determine that switch should be turned ON as called for in claim 1.

A Taurand specification portion indicated by the examiner, col. 18, lines 35 - 70, does not relate to a negative current flow used as claimed in claim 1. Rather this section is directed to the structure and operation of the current sensor 62 of Taurand's Fig. 10. The windings referred to in this section are the windings of a transformer that is a part of the current sensor and not the primary and secondary windings of the Fig. 10 DC-DC converter.

Also the section col. 6, lines 1 - 10 of Taurand cited in the Official Action only relate to a reason for use of Taurand's bidirectional current sensor. The section does not suggest detecting a reverse current in a semiconductor switch to determine when to switch ON that switch.

Further, there is nothing in the Taurand patent to suggest how or why the ringing signal generator of the Wadlington patent should be made into a DC-DC converter.

For each of the foregoing reasons claim 1 and dependent claims 2 - 10 are patentable over Wadlington, Kondo and Taurand and should now be allowed.

Independent claim 11 calls for:

> (c) means for sensing current in one of the first and second semiconductor switches, and
>
> (d) one of the control means being connected with the means for sensing and adapted to turn ON the semiconductor switch at substantially zero voltage across the switch and reverse current through the switch as sensed by the means for sensing.

The foregoing remarks regarding claim 1 and the Wadlington, Kondo and Taurand patents apply equally to claim 11 and the dependent claim 12 and these claims should now be allowed.

Independent claim 13 calls for in a DC-DC converter:

> (c) the secondary circuit voltage sensing control circuit being responsive to the voltage sensed to turn OFF the secondary switch when current in the secondary winding is in a range from substantially zero current and a reverse current level to induce in the primary winding a current level in a range from zero current to a reverse current level to thereby cause, when the secondary circuit voltage sensing control circuit senses an overvoltage condition, energy to be transferred back to the primary winding circuit from the secondary winding circuit at a level depending on the level of over-voltage.

Again the Wadlington patent does not relate to a DC-DC converter, but to a ringing signal generator the output of which is not DC. Neither Kondo nor Taurand teach conversion of the Wadlington circuit to a DC-DC converter.

In additional none of the three patents cited in the rejection of claim 13 teach the control of a converter in the above-quoted manner. Claim 13 and, by their dependency, claims 14 - 20 are patentable over Wadlington, Kondo and Taurand and should now be allowed.

Independent claim 33 is drawn to a DC-DC converter unlike the ringing signal generator of Wadlington. Claim 33 explicitly calls for:

> a positive feedback path including a further winding of the transformer in the primary circuit, the feedback path connected to apply a control signal in controlling relationship to the first signal-controlled semiconductor switching device.

Nothing of this nature appears in the Wadlington patent. Kondo shows no transformer, primary winding or "further winding of the transformer in the primary circuit." Taurand does not teach a further winding of the transformer but only the "primary inductor L_P" and the "secondary inductor L_S." The current sensor 62 described at col. 18 of Taurand does not have a winding on the transformer that includes L_P and L_S, but rather, a separate transformer of its own as shown at 620 in Fig. 16. Hence the three relied upon patents cannot be combined to arrive at a feature that is not found in any of them. And, of course, once again, there is nothing in either Kondo or Taurand to teach conversion of Wadlington's ringing signal generator to a DC-DC converter. Claim 33 is patentable over the cited art and should be allowed at this time.

Independent claim 34 relates to a DC-DC conversion method and calls for:

> (c) providing a first control circuit for turning ON and OFF the first semiconductor switch solely on the basis of operating parameters in the first circuit,
> (d) providing a second control circuit for turning ON and OFF the second semiconductor switch solely on the basis of operating parameters in the second circuit.

The Wadlington patent does not relate to DC-DC conversion. Further Wadlington's control of its primary switch 120 is not based solely on the operating parameters of the primary circuit. Note that voltage from the voltage divider consisting of the resistors 126 and 127 in Wadlington is applied to the control circuitry 140 and 150 for both the primary and the secondary.

The Kondo patent does not show a primary and secondary each with its own switch and switch control circuitry. And as pointed out in applicant's previous Response, Taurand's control of its primary switch is not independent of the output at the secondary. Note the connection from output via the comparator or op amp 61 to the primary switch controller 70 in Fig. 10. In addition neither Kondo nor Taurand teach the conversion of Wadlington to a DC-DC converter. Claim 34 and its dependent claim 35 for these reasons are patentable and should be allowed at this time it is urged.

Independent claim 36 relates to a method of DC-DC conversion including the steps of:

> (a) detecting by current sensing means in the second circuit when there is a reverse current through the second semiconductor switch,

(b) turning ON the second semiconductor switch while current therethrough is in a range from zero current to a level of reverse current and when voltage across the second semiconductor switch is substantially zero.

These steps as pointed out above with respect to claim 1, for example, are contrary to the teachings of Wadlington, Kondo and Taurand. Claim 36 and claims 37 - 42 dependent therefrom should be allowed at this time.

Early favorable reconsideration of this application is respectfully requested.

No fee is believed required, however, authorization is given to charge any additional fees associated with this communication to Deposit Account No. 070135. A duplicate copy of this sheet is enclosed.

Should the examiner have questions, comments or suggestions regarding this application, the examiner is invited to please contact the undersigned at the telephone number of email address listed below.

Respectfully submitted,

GALLAGHER & KENNEDY, P.A.

Date: October 2, 2007

By: Thomas D. MacBlain
Reg. No. 24,583
Attorneys for Applicant

Gallagher & Kennedy, P.A.
2575 East Camelback Road
Phoenix, AZ 85016
(602) 530-8088 phone
(602) 539-8500 fax
tdm@gknet.com